What is claimed is:

1. An electromagnetic friction clutch comprising:

a first clutch part and a second clutch part mounted so as to be rotatable relative to each other, the first clutch part having a soft magnetic material defining at least part of a magnetic circuit, the magnetic circuit having a magnetic force for pressing the first and second clutch parts together; and

at least one electromagnet being situated in the magnetic circuit to change the magnetic flux in the first and second clutch parts;

the magnetic circuit being guided in the first and second clutch parts in such a way that the magnetic flux changes at at least ten flux crossover points one after the other in a direction of flow of the magnetic circuit between the first and second clutch parts.

2. The electromagnetic friction clutch as recited in claim 1 wherein the soft magnetic material is at least partially configured as a laminated core having layers electrically insulated from each other at right angles to the direction of flow.

3. The electromagnetic friction clutch as recited in claim 1 wherein the electromagnet includes a coil and a soft magnetic core, the magnetic circuit having air gaps between the soft magnetic core and at least one of the first and second clutch parts, a cross section of the magnetic flux in the at least one air gap being at least five times greater than a smallest flux cross section in the soft magnetic material of the first clutch part.

4. The electromagnetic clutch as recited in claim 3 wherein the cross section of the magnetic flux in the air gaps is at least six times greater than the smallest flux cross section in the soft magnetic material.

5. The electromagnetic clutch as recited in claim 4 wherein the cross section of the magnetic flux in the air gaps is at least ten times greater than the smallest flux cross section in the soft magnetic material.

6. The electromagnetic friction clutch as recited in claim 1 wherein the first clutch part includes a first clamping jaw and a second clamping jaw movable with respect to each other, the second clutch part being positioned between the first and second clamping jaws, the soft magnetic material being positioned so that the magnetic flux changes at least once from the first clamping jaw through the second clutch part to second clamping jaw, and from the second clamping jaw back through the second clutch part to the first clamping jaw.

7. The electromagnetic friction clutch as recited in claim 1 wherein the first clutch part has at least one non-ferromagnetic support having a plurality of flux conductors made of the soft magnetic material positioned at a distance from each other, each flux conductor joining at least two flux crossover points with each other.

8. The electromagnetic friction clutch as recited in claim 7 wherein the flux conductors have a U-shaped cross-section, free ends of the U-shaped cross-section facing the flux crossover points.

9. The electromagnetic friction clutch as recited in claim 8 wherein the U-shaped cross sections of the flux conductors extend along at least one circular path concentric to an axis of rotation of at least one of the first and second clutch parts.

10. The electromagnetic friction clutch as recited in claim 9 wherein the circular path is an annular path.

11. The electromagnetic friction clutch as recited in claim 7 wherein a plurality of flux conductors are positioned on circular paths concentric with each other at varying distances from an axis of rotation of at least one of the first and second clutch parts, a cross-sectional area of the flux conductors in a plane defined by the axis of rotation and a normal to the axis of rotation decreasing as the distance from the axis of rotation increases so that the magnetic flux density is similar in the section of the magnetic circuit formed by the flux conductors.

12. The electromagnetic friction clutch as recited in claim 11 wherein the soft magnetic material is made of laminated layers, a number of the layers decreasing from inside to outside in the radial direction.

13. The electromagnetic friction clutch as recited in claim 8 wherein the first and second clutch parts have friction linings, the friction lining for the first clutch part being located between the free-ends of the U-shaped cross-section of the flux conductors.

14. The electromagnetic friction clutch as recited in claim 1 wherein the second clutch part is configured as a disk positioned between the clamping jaws.

15. The electromagnetic friction clutch as recited in claim 14 wherein the disk includes a soft magnetic material and has slots extending in the soft magnetic material of the disk in a plurality of rows adjacent to each other.

16. The electromagnetic friction clutch as recited in claim 15 wherein the slots extend on circular paths concentric to an axis of rotation.

17. The electromagnetic friction clutch as recited in claim 15 wherein disk includes a friction material in the slots.

18. The electromagnetic friction clutch as recited in claim 15 wherein the slots are defined by webs connected to each other by cross-webs of the soft magnetic material.

19. The electromagnetic friction clutch as recited in claim 18 wherein the cross-webs run radially to the axis of rotation.

20. The electromagnetic friction clutch as recited in claim 1 wherein the electromagnet includes a stationary coil, the clutch parts being mounted on a common shaft so as to be rotatable relative to the coil and relative to each other.

21. The electromagnetic friction clutch as recited in claim 1 wherein the electromagnet includes a coil and a soft magnetic core, the magnetic circuit having air gaps between the soft magnetic core and at least one of the first and second clutch parts, the air gaps being positioned in such a way that the magnetic flux passes through the air gaps radially to an axis of rotation.

22. The electromagnetic friction clutch as recited in claim 1 wherein the first clutch part includes a first and second clamping jaw, with the second clutch part being located between the first and second clutch parts, the first and second clamping jaws being connected to each other via toothing or a guide element in a rotationally fixed yet axially movable manner in relation to a axis of rotation.

23. The electromagnetic friction clutch as recited in claim 1 wherein the first clutch part is connected in a rotationally fixed manner with a shaft and the second clutch part is configured as a wheel with an outer circumference for engaging a belt, a chain, or other drive device

24. The electromagnetic friction clutch as recited in claim 23 wherein the shaft is a camshaft of an internal combustion engine and the belt, chain or other drive device has a drive connection with a crankshaft of the internal combustion engine.

25. The electromagnetic friction clutch as recited in claim 1 wherein at least one permanent magnet is situated in the magnetic circuit to produce at least part of the magnetic flux, the electromagnet being configured to weaken and/or strengthen the magnetic flux produced by the at least one permanent magnet in the magnetic circuit.

27. The electromagnetic friction clutch as recited in claim 25 wherein a cross section of the magnetic flux in the permanent magnet is at least six times greater than a smallest flux cross section in the soft magnetic material.

28. The electromagnetic friction clutch as recited in claim 27 wherein the cross section of the magnetic flux in the permanent magnet is at least ten times greater than the smallest flux cross section in the soft magnetic material.

29. The electromagnetic friction clutch as recited in claim 27 wherein the at least one permanent magnet is positioned between at least one air gap and a soft magnetic material of the electromagnet or the soft magnetic material of the first clutch part so that one of the magnetic poles of the permanent magnet faces the air gap and the other magnetic pole faces the soft magnetic material of the electromagnet or the first clutch part.

30. An electromagnetic friction clutch comprising:

a first clutch part and a second clutch part mounted so as to be rotatable relative to each other, the first clutch part having a soft magnetic material defining at least part of a magnetic circuit, the magnetic circuit having a magnetic force for pressing the first and second clutch parts together;

at least one electromagnet being situated in the magnetic circuit to change the magnetic flux in the first and second clutch parts;

a transducer element connected to at least one of the first and second clutch parts so that when the first and second clutch parts are rotated relative to each other, the transducer element moves relative to both the first and second clutch parts; and

a sensor for determining the position of the transducer element and measuring indirectly an angle of rotation between the first and second clutch parts.

31. The electromagnetic friction clutch as recited in claim 30 wherein the transducer element is connected to each of the first and second clutch parts via a sliding guide, sliding directions of the sliding guides running at an angle to each other so that the transducer element moves toward or away from the first and second clutch parts when the first and second clutch parts are rotated relative to each other

32. The electromagnetic friction clutch as recited in claim 31 wherein the sensor for measuring the displacement path of the transducer element is configured as a distance sensor.

33. The electromagnetic friction clutch as recited in claim 31 wherein a first sliding guide of the sliding guides has a displacement path running along a spiral-shaped curved path coaxial to an axis of rotation of at least one of the first and second clutch parts.

34. The electromagnetic friction clutch as recited in claim 33 wherein a second sliding guide of the sliding guides is a linear guide and has an axial displacement path.

35. The electromagnetic friction clutch as recited in claim 30 wherein the transducer element is configured as a ring element positioned concentrically to an axis of rotation of at least one of the first and second clutch parts.

36. An electromagnetic friction clutch comprising:

a first clutch part and a second clutch part mounted so as to be rotatable relative to each other, the first clutch part having a soft magnetic material defining at least part of a magnetic circuit, the magnetic circuit having a magnetic force for pressing the first and second clutch parts together;

at least one electromagnet being situated in the magnetic circuit to change the magnetic flux in the first and second clutch parts;

the magnetic circuit being guided in the first and second clutch parts so that the magnetic flux changes at at least five flux crossover points one after the other in a direction of flow of the magnetic circuit between the first and second clutch parts, the soft magnetic material being at least partially configured as a laminated core having layers electrically insulated from each other at right angles to the direction of flow.

37. An electromagnetic friction clutch comprising:

a first clutch part and a second clutch part mounted so as to be rotatable relative to each other, at least one of the first and second clutch parts having a soft magnetic material defining at least part of a magnetic circuit, the magnetic circuit having a magnetic force for pressing the first and second clutch parts together;

at least one electromagnet being situated in the magnetic circuit to change the magnetic flux in the first and second clutch parts, the electromagnet having a coil and a soft magnetic core,

and the magnetic circuit having air gaps between the soft magnetic core and at least one of the first and second clutch parts,

a cross section of the magnetic flux in at least one air gap being at least five times greater than a smallest flux cross section in the soft magnetic material of the magnetic circuit.